



SPECIALIZATION PATHS

- Experimental / large accelerators
- Theoretical
- Applied / small accelerators

NUMBER OF ECTS CREDITS

- 120 (60 ECTS / year)

PUBLIC FEES

- 3.000 euro / year

LANGUAGE OF INSTRUCTION

- English

HOST INSTITUTIONS

- University of Seville (Spain)
- University of Barcelona (Spain)
- University Complutense of Madrid (Spain)
- University Autonoma of Madrid (Spain)
- University of Salamanca (Spain)
- University of Catania (Italy)
- University of Padova (Italy)
- University of Caen (France)

DESCRIPTION AND OBJECTIVES

NucPhys is a 2-years Erasmus Mundus Master in Nuclear Physics (120 ECTS) and it is offered by a consortium of 8 partner universities in Spain, France and Italy, **with the participation of more than 25 research institutions/companies as associated partners worldwide**. Nuclear Physics is a broad matter of relevance from both the fundamental knowledge of Nature and the multiple applications to different fields of strategic economical relevance. Consequently, in this Master, fundamental theory and experiments as well as applications will be presented.

The main objective of the Master programme is to provide top-ranked students with an excellent background in Nuclear Physics so as to educate experts and foster their future career in this field. At the same time, NucPhys students carry out their master studies in least 3 countries, in a stimulating and scientifically excellent international environment, including Research internships (12 ECTS) carried out in companies or research institutions.

ADMISSION PROFILE

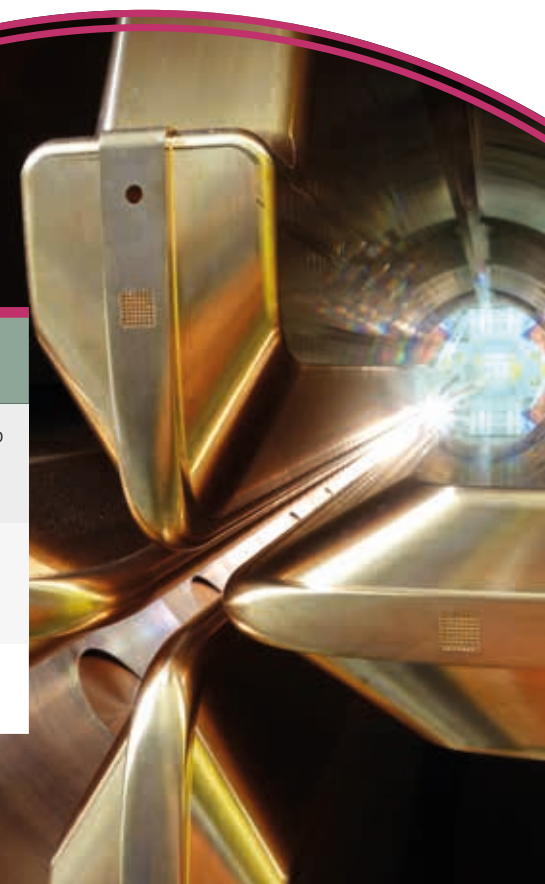
- NucPhys is aimed at all graduated in Physics, Chemistry, Engineering, Applied Mathematics or any other kind of scientist or engineer degree.
- Candidates from countries where English is not one of the official languages, must demonstrate their knowledge of English with a certified language level equivalent to B2 using the CEFR (Common European Framework of Reference for Languages).

16 ERASMUS+ SCHOLARSHIPS AVAILABLE

The Master scholarships from the ERASMUS + program include	Partner Country Up to 4 scholarships	Programme Country Up to 12 scholarships
Contribution to travel, installation and any other type of costs	up to € 3000 per year for costs for scholarship holder resident in a partner country. € 1000 for installation costs.	up to € 1000 per year per scholarship holder resident in a Programme Country for travel & installation costs
Contribution to subsistence costs (for both Programme and Partner Country scholarship holders)	€ 1000 / month for the entire duration of the EM study programme (24 months maximum)	
Contribution to participation costs	€ 6000 for the entire duration of the EM study programme (24 months) (this will cover mainly the inscription costs in the Master)	

NUCPHYS WILL BE PARTICULARLY USEFUL FOR

- Research in the field of Fundamental Subatomic Physics
- Medical physics and hadrontherapy
- Radiology
- Environmental radioactivity
- Nuclear techniques for multi-elemental analysis
- Nuclear dating techniques
- Nuclear power plants and waste management





PATH 1

EXPERIMENTS AND
INSTRUMENTATION
IN LARGE ACCELERATORS

PATH 2

THEORETICAL
NUCLEAR PHYSICS

PATH 3

APPLICATIONS AND
SMALL ACCELERATORS

SPECIFIC OBJECTIVES OF THE PATH

The aim of this path is the advanced education of young students in experimental Nuclear Physics using large accelerators. Most of the largest accelerators in the world are associated partners of this Master and students could have the opportunity of visiting these facilities.

The specific objectives of the theoretical path can be identified with providing the students with a solid preparation in several features of nuclear structure, nuclear dynamics, nuclear astrophysics and in various other aspects of theory of fundamental interactions.

The aim of this path is the advanced education of young students to different applications (medicine, environment, archeometry, accelerators, etc.) in the field of Nuclear Physics.

BRIEF PROGRAM DESCRIPTION AND COURSE GENERAL CONTENT

The path includes master-level courses in Quantum Mechanics, Structure and Reactions in Nuclear Physics, Experimental Techniques at basic and advanced level, and different applications of Nuclear Physics, etc. Additional extra-curriculum courses will be offered as computing and numerical calculations, plasma physics and fusion with the participation of external experts. Several visits to Spanish facilities are programmed.

The students will have the opportunity to interact with major experts in the various fields at the international level. Besides this, this path aims at the training on the use of particle detectors, and of other experimental instrumentation for the study of Physics of Fundamental Interactions, Matter and Astrophysics. The student will also learn recent technics for data taking and analysis. Different activities are programmed, including a visit to the Laboratori Nazionali di Legnaro.

The path includes master-level courses in Quantum Mechanics, Statistical Mechanics, Nuclear Physics and Nuclear Astrophysics. Furthermore, advanced courses in nuclear physics applications will be held also with the participation of external experts. Both in the regular courses and in extra activities, students will be approached to experimental techniques, detectors, accelerators and analysis procedures. Different activities are programmed, including a visit to the Laboratory Nazionali di Sud, including the two accelerators, the experimental halls and the Radioactivity Laboratory.

TECHNICAL SPECIFICATIONS OF THE PATH

The courses of the two first semesters will be held in English at the Physics Faculty of the **University of Seville**. During the first year, students will have the opportunity of visiting other Spanish Universities: Complutense and Autónoma de Madrid, Barcelona and Salamanca. During the second year, students will receive lectures in **University of Caen** (including the internship). In the first half of the academic year and will move to Italy during the second part to develop a master thesis in experimental nuclear physics.

All lectures of the first two semesters are held in English at the Department of Physics and Astronomy of the **University of Padova**. During the second year, students will receive lectures in **University of Caen** (including the internship). In the first half of the academic year and will move to Spain during the second part to develop a master thesis in theoretical nuclear physics.

The courses will be held in English at the Department of Physics and Astronomy, **University of Catania**, within the International Curriculum of the Master Course in Physics. During the second year, students will receive lectures in **University of Caen** (including the internship). In the first half of the academic year and will move to Spain during the second part to develop a master thesis in applications of nuclear physics.

CAREER OPPORTUNITIES

Thanks to high-level education on general aspects in subatomic physics and to specific experimental and technical acquired competences, students can be projected towards different career opportunities both in the academic sector (fundamental research in physics) and in the R&D department of industries in all the technology sectors dealing with ion beams, data acquisition and instrumentation. A continuation in PhD is also foreseen.

The theoretical path has as natural development an academic career and/or an activity in research in fundamental nuclear and particle physics and astrophysics. Furthermore, the skills acquired and the high level of scientific preparation will be able to provide these students with job opportunities in all the different fields needing modelling, data storage and analysis, software package development and related areas. A continuation in PhD is foreseen.

The high-level education on general aspects in subatomic physics and the specific experimental and technical competences acquired in this path concerning the different nuclear physics applications of social interest will allow students to access executive positions in companies or laboratories dealing with radiation protection, waste management, proton and hadrontherapy, radioisotopes for medicine, archeometry, accelerators, etc. A continuation in PhD is also possible.